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Operating Company, Inc.
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ND-10-0724

FEDERAL EXPRESS
Vogtle Electric Generating Plant
Air Quality Permit Application No. 18986
Vogtle Units 3 and 4 Project
AIRS No.: 033-00030

Mr. Eric Cornwell
Georgia Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, Georgia 30354

Dear Mr. Cornwell:

In response to the Georgia Environmental Protection Division (EPD) requests associated with the Vogtle Units 3 & 4 Air Quality Permit Application No. 18986, Southern Nuclear Operating Company (SNC) provides the following additional information as related to the "Top-down" BACT analysis and the PM_{10} Surrogate Policy. The attached information is provided to facilitate EPD's review of the Air Quality Permit Application No. 18986 and development of the final air quality permit.

Attachment 1 is a revision to the "Top-down BACT Analysis Supporting Documentation" provided September 11, 2009 as attachment 1 of letter ND-09-1451. The Top-down BACT Analysis was revised to include an economic analysis for emission control devices used to reduce PM, CO, VOC, and NOx for each diesel generator and fire pump. The economic analysis used a conservative runtime estimate of 500 hours for each control device to reduce PM, CO, VOC, and NOx. In addition an economic analysis using 100 hours of runtime for CO and VOC control devices was completed, which is a more realistic representation of expected equipment runtime.

Attachment 2 provides additional justification for SNC's use of PM_{10} as a surrogate for $PM_{2.5}$ in the air permit application submitted in May 2009. The sources of PM_{10}/ $PM_{2.5}$ included in the permit are the combustion engines and cooling towers.

Please direct questions, comments, or requests for information associated with this Air Quality Permit to Dale L. Fulton at (205) 992-7536 or me at (205) 992-5807.

Sincerely,

Dale L. Fulton
Environmental Specialist
Southern Nuclear Operating Company

DLF:lmp

Enclosure:
Attachment 1 – Revised Top-down BACT Analysis Supporting Documentation
Attachment 2 – Additional Information Regarding the PM_{10} Surrogate Policy

cc:
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SNC Document Services – Vogtle CVA02.003 and AR01.1053
EA File: E.05.93
EA File: E.03.93

ATTACHMENT 1

to ND-10-0724
Air Quality Permit Application No. 18986

Revised Top-down BACT Analysis Supporting Documentation

As discussed in sections 4.4.1, Control Technology Review and 6.0, Best Available Control Technology of the Vogtle Units 3&4 Air Quality Permit Application No. 18986, a BACT analyses was conducted using the top-down analysis approach. The methodology of the top-down approach is described in Section 6.0 of the application. The following information is provided as a supplement to the analysis included in the application.

PM/PM_{10}

Under proper combustion conditions only a small amount of PM results from the combustion of diesel fuel in internal combustion engines. However, carbon soot particles can form black smoke due to insufficient oxygen, and lubricating oil leaks that reach the combustion chamber can form a blue smoke when they are partially burned.

<u>Identify Potentially Available Control Technologies</u>
The following control technologies were evaluated as being potentially available for controlling PM/PM_{10} from the diesel engines:

- Particulate Filters
- Combustion Process Design
- Ultra Low Sulfur Fuel Oil
- Proper Maintenance

Particulate Filters
Because of combustion controls included in modern internal combustion engines, the uncontrolled PM/PM_{10} emissions are very low. Based on a review of the RBLC database, no diesel engines include an add-on control for PM/PM_{10}. The engine manufacturers may use catalyzed diesel particulate filters in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Combustion Process Design
Carbon soot particles can form black smoke in the combustion chamber if the combustion reaction is oxygen deficient. Therefore, good combustion process design that ensures the proper air and fuel mixing, extended combustion chamber residence times, and consistent high combustion chamber temperatures can reduce the formation carbon soot and black smoke. Good combustion process design is a standard feature of modern engines.

Ultra Low Sulfur Fuel Oil
The quality of the diesel fuel can influence the particulate emissions in that typically more refined products have lower ash contents. Ultra low sulfur diesel fuel has the lowest sulfur content (0.0015%) of any readily available diesel fuel.

Proper Maintenance
Lubricating oil leaks that reach the combustion chamber and are partially burned can produce blue smoke. Proper maintenance is the most effective method of preventing blue smoke from internal combustion engines.

Technical Feasibility

Particulate Filters

Conventional add-on particulate control technologies are not considered feasible for use on the internal combustion engines proposed for this project since none have been identified as currently in use in similar engines in the RBLC. However, the engine manufacturers may use catalyzed diesel particulate filters in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Combustion Process Design

Combustion controls including combustion system design, proper operation, and routine maintenance have been applied successfully in similar engines for lowering carbon soot emissions and are considered technically feasible.

Ultra Low Sulfur Fuel Oil

Ultra low sulfur fuel is readily available and is therefore considered technically feasible.

Proper Maintenance

Proper maintenance has been proven to be effective in minimizing the formation blue smoke in internal combustion engines; therefore, it is considered technically feasible.

Rank Control Technologies/Evaluate the Most Effective

Any of the technologies identified above are potentially feasible for the control of PM/PM_{10} from stationary diesel engines. Although the specific engines proposed for this project have not yet been selected, it is likely that each of the identified technologies would be considered technically feasible for the final choice in engine design. However, without specific engine data it is not possible to analyze the economic justification of all of these potentially feasible control options. Accordingly, this application proposes limits that are among the lowest of the recently permitted facilities identified in the RBLC and will therefore require the use of the top level available and economically justifiable control technology.

The use of all four control technologies/strategies offers the highest level of control for the proposed engines. An economic analysis shown below, demonstrates that add on particulate filters are not cost effective. Accordingly the highest remaining ranked level of control is implementation of the other three technology strategies, which is proposed as BACT.

Engine	Annual Emission Basis (tons @ 500 hr/yr)	Estimated Total Capital Investment	Estimated Annualized Costs	Emissions Reductions (Tons Assuming 90% Removal)	Cost Effectiveness ($/ton)
5,560 KW	0.45	$83,400	$18,435	0.41	$45,520
1,500 KW	0.13	$22,500	$4,974	0.113	$44,210
168 KW	0.013	$4,000	$848	0.0113	$75,394
75 KW	0.018	$4,000	$814	0.016	$51,697

Annualized costs include capital recovery (10 yr equipment life and 7% interest), maintenance, and operation.

Source: Costs and reduction information calculated from "Assessment of Emerging Low-Emission Technologies for Combustion-Based Distributed Resource Generators" (EPRI, 2006).

CO

Carbon Monoxide is formed in an internal combustion engine as an intermediate combustion product that appears in the exhaust when the reaction of CO to CO2 cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short.

Identify Potentially Available Control Technologies

The following control technologies were evaluated as being potentially available for controlling CO from the diesel engines:

- Combustion Process Design
- Catalytic Oxidation

Combustion Process Design
CO emissions from internal combustion engines result from the incomplete combustion of carbon and are indicative of inefficient combustion and unused energy. Factors affecting CO emissions include firing temperatures, residence time in the combustion zone, and combustion chamber fuel and air mixing characteristics. Therefore, good combustion process design that ensures the proper air and fuel mixing, extended combustion chamber residence times, and consistent high combustion chamber temperatures can reduce emissions of CO. Good combustion process design is a standard feature of modern engines.

Catalytic Oxidation
Oxidation catalysts lower CO emissions as a post combustion control. In a catalytic oxidation process precious metals (commonly rhodium, platinum, or palladium) are used to promote oxidation of CO to CO_2 at temperatures lower than would be necessary for oxidation without a catalyst. Although there are several potential oxidation catalysts that can be used, including the catalyzed diesel particulate filters discussed in the PM/PM_{10} section, they all achieve CO reduction through the same mechanism. The engine manufacturers may use catalytic oxidation in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Technical Feasibility

Combustion Process Design
Combustion controls including combustion system design, proper operation, and routine maintenance have been applied successfully in similar engines for lowering CO emissions and are considered technically feasible.

Catalytic Oxidation
Based on a review of the RBLC database, no diesel engines were identified as using oxidation catalysts for the control of CO. However, the engine manufacturers may

utilize catalytic oxidation in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Rank Control Technologies/Evaluate the Most Effective

See discussion in the VOC section.

VOC

Volatile Organic Compounds (VOC), commonly classified as hydrocarbons, consist of a wide variety of organic compounds that are discharged into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported or injected into the quench layer, where temperatures are too low to support combustion. Partially burned hydrocarbons can occur if there is a lack of available oxygen near the hydrocarbon molecule during combustion, if the gas temperature is too low, if the fuel droplet is too large, or if the residence time in the cylinder is too short.

Identify Potentially Available Control Technologies

The following control technologies were evaluated as being potentially available for controlling CO from the diesel engines:

- Combustion Process Design
- Catalytic Oxidation

Combustion Process Design

VOC emissions from internal combustion engines result from the incomplete combustion of carbon and are indicative of inefficient combustion and unused energy. Factors affecting VOC emissions include firing temperatures, residence time in the combustion zone, and combustion chamber fuel and air mixing characteristics. Therefore, good combustion process design that ensures the proper air and fuel mixing, extended combustion chamber residence times, and consistent high combustion chamber temperatures can reduce emissions of VOC. Good combustion process design is a standard feature of modern engines.

Catalytic Oxidation

Oxidation catalysts lower VOC emissions as a post combustion control. In a catalytic oxidation process precious metals (commonly rhodium, platinum, or palladium) are used to promote oxidation of the carbon atoms in the hydrocarbons to CO_2 at temperatures lower than would be necessary for oxidation without a catalyst. Although there are several potential oxidation catalysts that can be used, including the catalyzed diesel particulate filters discussed in the PM/PM_{10} section, they all achieve VOC reduction through the same mechanism. The engine manufacturers may use catalytic oxidation in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Technical Feasibility

Combustion Process Design

Combustion controls including combustion system design, proper operation, and routine maintenance have been applied successfully in similar engines for lowering CO emissions and are considered technically feasible.

Catalytic Oxidation

Based on a review of the RBLC database, no diesel engines were identified as using oxidation catalysts for the control of VOC. However, the engine manufacturers may utilize catalytic oxidation in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Rank Control Technologies/Evaluate the Most Effective

The use of both control technologies/strategies offers the highest level of control for the proposed engines for VOC and CO. An economic analysis shown below, demonstrates that add on catalytic oxidation is not cost effective. Accordingly, the highest remaining ranked level of control is implementation of the other technology strategy, which is proposed as BACT.

Engine	Annual Emission Basis (tons @ 500 hr/yr)	Estimated Total Capital Investment	Estimated Annualized Costs	Emissions Reductions (Tons Assuming 90% CO and 50% VOC Removal)	Cost Effectiveness ($/ton)
5,560 KW	9.5 tons CO 0.93 tons VOC	$188,484	$39,120	9.0	$4,330
1,500 KW	2.9 tons CO 0.28 tons VOC	$50,850	$10,554	2.7	$3,905
168 KW	0.13 tons CO 0.03 tons VOC	$5,695	$1,182	0.13	$8,805
75 KW	0.21 tons CO 0.03 tons VOC	$4,000	$814	0.20	$4,037

Engine	Annual Emission Basis (tons @ 100 hr/yr)	Estimated Total Capital Investment	Estimated Annualized Costs	Emissions Reductions (Tons Assuming 90% CO and 50% VOC Removal)	Cost Effectiveness ($/ton)
5,560 KW	1.9 tons CO 0.19 tons VOC	$188,484	$39,120	1.81	$21,649
1,500 KW	0.6 tons CO 0.06 tons VOC	$50,850	$10,554	0.54	$19,526
168 KW	0.03 tons CO 0.01 tons VOC	$5,695	$1,182	0.03	$44,023
75 KW	0.04 tons CO 0.01 tons VOC	$4,000	$814	0.04	$20,184

Annualized costs include capital recovery (10 yr equipment life and 7% interest), maintenance, and operation.

Source: Costs and reduction information calculated from "Assessment of Emerging Low-Emission Technologies for Combustion-Based Distributed Resource Generators" (EPRI, 2006).

NO_X

Nitrogen oxide (NO_X) emissions from combustion sources are formed by two different mechanisms. The predominant mechanism in an internal combustion engine is thermal NO_X which arises from the thermal dissociation and subsequent reaction of nitrogen (N_2) and oxygen (O_2) molecules in the combustion air. The second mechanism, fuel NO_X, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Most distillate oils have no chemically-bound fuel N_2 and essentially all NO_X formed is thermal NO_X. In general, NO_X and CO/VOC emissions are inversely related (i.e. decreasing NO_X emissions will result in increasing CO/VOC emissions).

Identify Potentially Available Control Technologies

The following control technologies were evaluated as being potentially available for controlling NO_X from the diesel engines:

- Combustion Process Design
- Non-Selective Catalytic Reduction
- Exhaust Gas Recirculation (with NSCR)
- Selective Catalytic Reduction
- EMx™ (SCONO$_x$™)

Combustion Process Design
Potential combustion process designs for NO_X reduction include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio, and derating. ITR involves retarding the timing of the diesel fuel injection into the combustion chamber causing the combustion process to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. By increasing the volume, the combustion temperature and pressure are lowered, thereby reducing NO_X formation. A PCC is an antechamber that ignites a fuel rich mixture that propogates to the main combustion chamber. The high exit velocity results in improved mixing and complete combustion of the lean/fuel mixture which lowers the combustion temperature, thereby reducing NO_X emissions. Air-to-fuel ratios can be adjusted to control the amount of fuel entering each cylinder. Fuel rich mixtures lower the amount of available oxygen thereby lowering temperatures and NO_X emissions. Derating involves restricting engine operation to lower than normal levels of power production. This lowers cylinder pressure and temperature, thereby lowering NO_X emissions. The engine manufacturers could potentially use any of these methods in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Non-Selective Catalytic Reduction
Non-Selective Catalytic Reduction (NSCR) reduces NOX emissions as a post combustion control. NSCR typically utilizes two or three precious metal catalysts to reduce NOX emissions in two discrete and sequential steps. Step 1 removes excess oxygen from the exhaust gas while step 2 reduces the NOX concentration. NSCR is also referred to as 3-way catalysts because it can simultaneously reduce NOX, CO, and VOC. NSCR are not effective if high levels of oxygen are present in the exhaust gas; therefore, they are only applicable in fuel-rich engines. The engine manufacturers could potentially use NSCR in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Exhaust Gas Recirculation (with NSCR)
Exhaust gas recirculation (EGR) involves recirculating exhaust gas into the combustion chamber. This results in lower oxygen levels in the combustion chamber, which results in less oxygen available and lower NO_X emissions. Lowering oxygen levels in the combustion chamber can also result in less oxygen in the exhaust gas to levels acceptable for NSCR operation. The engine manufacturers could potentially use EGR either alone or in combination with NSCR in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Selective Catalytic Reduction
Selective Catalytic Reduction (SCR) reduces NO_x emissions by reacting ammonia or urea with exhaust gas NO_x to yield nitrogen and water vapor in the presence of a catalyst. The engine manufacturers may use SCR in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

EMx™ (SCONO$_x$™)
EMx™ (formerly referred to as SCONO$_x$™) is a multi-pollutant reduction catalytic control system offered by EmeraChem. EMx™ is a complex technology that is designed to simultaneously reduce NO_x, VOC, and CO through a series of oxidation/absorption catalytic reactions. The EMx™ system employs a single catalyst to simultaneously oxidize CO to CO_2 and NO to NO_2. NO_2 formed by the oxidation of NO is subsequently absorbed onto the catalyst surface through the use of a potassium carbonate absorber coating. There have been no installations of this technology on reciprocating engines.

Technical Feasibility

Combustion Process Design

The combustion process designs identified have been applied successfully and the engine manufacturers may use any of these methods in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Non-Selective Catalytic Reduction

Based on a review of the RBLC database, no diesel engines were identified as using NSCR for the control of NO_X. Additionally, NSCR are not effective if high levels of oxygen are present in the exhaust gas; therefore, they are only applicable in engines operated in fuel-rich conditions. Diesel engines are typically designed to operate in lean conditions. However, the engine manufacturers may use NSCR in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Exhaust Gas Recirculation with NSCR

Based on a review of the RBLC database, no diesel engines were identified as using EGR either alone or in combination with NSCR for the control of NO_X. However, the engine manufacturers may use EGR either alone or in combination with NSCR in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

Selective Catalytic Reduction

Based on a review of the RBLC database, no diesel engines were identified as using SCR for the control of NO_X. However, the engine manufacturers may use SCR in the design of their engines to meet the requirements of NSPS Subpart IIII and the proposed permit limits.

EMx™ (SCONO$_x$™)

There have been no installations of this technology on reciprocating engines; therefore, it is not considered applicable in this application.

Rank Control Technologies/Evaluate the Most Effective

Because the use of SCONOx™ or NSCR (including three-way catalysts or EGR designs) is not technically feasible for use on lean operating diesel engines, the use of good combustion process design plus SCR offers the highest level of control for the proposed engines. An economic analysis shown below, demonstrates that an add-on SCR is not cost effective. Accordingly the highest remaining ranked level of control is good combustion process design, which is proposed as BACT.

Engine	Annual Emission Basis (tons @ 500 hr/yr)	Estimated Total Capital Investment	Estimated Annualized Costs	Emissions Reductions (Tons Assuming 90% Removal)	Cost Effectiveness ($/ton)
5,560 KW	4.9	$756,160	$173,629	4.4	$39,372
1,500 KW	1.33	$360,000	$79,330	1.2	$66,524
168 KW	0.3	$54,430	$12,165	0.27	$45,056
75 KW	0.3	$24,300	$5,431	0.27	$20,114

Annualized costs include capital recovery (10 yr equipment life and 7% interest), maintenance, and operation.

Source: Costs and reduction information calculated from "Assessment of Emerging Low-Emission Technologies for Combustion-Based Distributed Resource Generators" (EPRI, 2006).

ATTACHMENT 2

to ND-10-0724
Air Quality Permit Application No. 18986

Additional information Regarding the PM_{10} Surrogate Policy

PM_{10} Surrogate Policy

It is reasonable for GEPD to use PM_{10} as a surrogate for $PM_{2.5}$ in this case because of the following:

- For each source type, the uncontrolled and controlled emissions of $PM_{2.5}$ generally correlate with the respective PM_{10} emission rates,
- the BACT selected for PM_{10} for each source is the same as what would be selected for $PM_{2.5}$, and
- Conservative analysis of the ambient air quality modeling results for PM_{10} confirm compliance with the $PM_{2.5}$ NAAQS.

The correlation, BACT, and air quality analysis basis for the surrogate policy is discussed below. Moreover, until EPA promulgates a test method for condensable particulate matter and the final rule that would establish threshold levels for $PM_{2.5}$ significant impacts, increments and monitoring for PSD impact analyses, it is appropriate to allow the continued use of PM_{10} analyses as surrogates for $PM_{2.5}$ compliance.

The permit application addresses two types of sources of PM_{10}/$PM_{2.5}$.

Cooling Towers

The drift emissions from the Circulating Water System cooling towers are limited to the particulate associated with dissolved solids in liquid droplets that become entrained in the air stream exiting the cooling tower. The particle size distribution is dependent on several factors including the design of the cooling tower and drift eliminators, and the concentration of dissolved solids in the recirculating water (e.g., higher concentrations of dissolved solids may result in fewer particles below 2.5 microns aerodynamic diameter). Based on the Reisman and Frisbie method, "Calculating Realistic PM_{10} Emissions from Cooling Towers" (Reisman and Frisbie, 2002), $PM_{2.5}$ emissions would be less than 1% of the PM_{10} emissions at the assumed TDS concentration. Application of the Reisman and Frisbie method to the specific cooling tower proposed is shown below. This ratio would hold despite variance in circulation rates or expected TDS concentrations of the cooling tower. Accordingly, this represents a reliable statistical relationship over the operating range of the cooling towers. Therefore, 1% of the PM_{10} represents a reasonable and conservative proxy and surrogate for $PM_{2.5}$ from the cooling towers. Accordingly, demonstration of compliance with PM_{10} modeling and BACT analysis requirements provides material and reasonable basis for assessing compliance with the $PM_{2.5}$ standards. Even if the Reisman and Frisbie method understated $PM_{2.5}$ ratios by a factor of 10, emissions would only be approximately 3% of PM_{10} in this specific case. Even assuming this conservative ratio, us use of the surrogate policy is appropriate on this basis.

"Calculating Realistic PM10 Emissions from Cooling Towers" (Reisman and Frisbie, 2002)							
Make Up Water TDS:					150	ppmw	from PSD application
Cycles of Concentration:					8		from PSD application
Cooling Tower Recirculating Water TDS:					1,200	ppmw	from PSD application
Cooling Tower PM10 Density (assumed NaCl):					2.2	g/cm3	Density of salt
Cooling Tower Water Density					1	g/cm3	Density of fresh Water

Calculated Particle Size Distribution

Droplet Diameter (10^{-6} m)	Droplet Volume (m^3)	Droplet Mass (g)	Particle Mass (g)	Particle Volume (m^3)	Particle Diameter (10^{-6} m)	Mass Fraction (%)
From Reisman Frisbie	4/3 pi * droplet radius ^3	Droplet V * Density Fresh Water	Droplet Mass * % TDS	Particle Mass / Density of Salt	2 * (3/4pi * Particle V) ^1/3	From Reisman Frisbie
10	5.24 E-16	5.24 E-10	6.28 E-13	2.86 E-19	0.817	0.000
20	4.19 E-15	4.19 E-09	5.03 E-12	2.28 E-18	1.634	0.196
30	1.41 E-14	1.41 E-08	1.70 E-11	7.71 E-18	2.451	0.226
40	3.35 E-14	3.35 E-08	4.02 E-11	1.83 E-17	3.268	0.514
50	6.54 E-14	6.54 E-08	7.85 E-11	3.57 E-17	4.085	1.816
60	1.13 E-13	1.13 E-07	1.36 E-10	6.17 E-17	4.902	5.702
70	1.80 E-13	1.80 E-07	2.16 E-10	9.80 E-17	5.719	21.348
90	3.82 E-13	3.82 E-07	4.58 E-10	2.08 E-16	7.354	49.812
110	6.97 E-13	6.97 E-07	8.36 E-10	3.80 E-16	8.988	70.509
130	1.15 E-12	1.15 E-06	1.38 E-09	6.27 E-16	10.622	82.023
150	1.77 E-12	1.77 E-06	2.12 E-09	9.64 E-16	12.256	88.012
180	3.05 E-12	3.05 E-06	3.66 E-09	1.67 E-15	14.707	91.032
210	4.85 E-12	4.85 E-06	5.82 E-09	2.64 E-15	17.158	92.468
240	7.24 E-12	7.24 E-06	8.69 E-09	3.95 E-15	19.609	94.091
270	1.03 E-11	1.03 E-05	1.24 E-08	5.62 E-15	22.061	94.689
300	1.41 E-11	1.41 E-05	1.70 E-08	7.71 E-15	24.512	96.288
350	2.24 E-11	2.24 E-05	2.69 E-08	1.22 E-14	28.597	97.011
400	3.35 E-11	3.35 E-05	4.02 E-08	1.83 E-14	32.682	98.340
450	4.77 E-11	4.77 E-05	5.73 E-08	2.60 E-14	36.768	99.071
500	6.54 E-11	6.54 E-05	7.85 E-08	3.57 E-14	40.853	99.071
600	1.13 E-10	1.13 E-04	1.36 E-07	6.17 E-14	49.023	100.000

PM2.5 - Linear Interpolation

30	1.41 E-14	1.41 E-08	1.70 E-11	7.71 E-18	2.451	0.226	
40	3.35 E-14	3.35 E-08	4.02 E-11	1.83 E-17	3.268	0.514	
					PM2.5 Mass Fraction=	0.2432	%

PM10 - Linear Interpolation

110	6.97 E-13	6.97 E-07	8.36 E-10	3.80 E-16	8.988	70.509	
130	1.15 E-12	1.15 E-06	1.38 E-09	6.27 E-16	10.622	82.023	
					PM10 Mass Fraction=	77.6421	%
					PM2.5 / PM10 =	0.0031	
					% =	**0.31%**	**of PM10 is PM2.5**

Specifically regarding BACT, high efficiency drift eliminators (i.e., 0.0005% drift rate) were chosen as BACT for this source. Drift eliminators are the only control technology available for wet cooling towers, and are appropriate for controlling both PM_{10} and $PM_{2.5}$.

Combustion Sources

The combustion sources proposed at the facility include the emergency generator and fire pump internal combustion engines. Particulate emissions from combustion sources are largely the result of incomplete fuel combustion. Accordingly, for purposes of this application, the applicant assumed that all particulate matter emissions from combustion sources fall within the PM_{10} size range. To support application of the surrogate policy it is further assumed that essentially all of the PM_{10} is $PM_{2.5}$. As a result, to support application of the surrogate policy a one-to-one correlation is assumed and no more conservative correlation is possible. This statistical relationship means that PM_{10} emissions from the combustion sources constitute a reasonable proxy for $PM_{2.5}$ emissions.

There are no additional post-combustion controls that would have been evaluated for $PM_{2.5}$ that were not evaluated for PM_{10}. Post-combustion controls for PM_{10} were not determined appropriate for the combustion sources in the permit and the result would be the same for $PM_{2.5}$ in light of the presumed identical emission raters. All of the combustion sources will fire inherently clean fuels resulting in low particulate concentration in the exhaust gas. The rate that reflects BACT for particulate matter selected for all of the combustion sources would not have changed for $PM_{2.5}$. Since the selected BACT will limit the production of particulate products of combustion which comprise the $PM_{2.5}/PM_{10}$ emissions, and $PM_{2.5}$ is assumed to represent essentially all of the particulate emissions, the efficiency of BACT for both size fractions is considered to be the same.

Finally, based on the correlations established above (i.e. essentially no $PM_{2.5}$ emissions result from the cooling towers, and essentially all PM_{10} emissions from the combustion sources are $PM_{2.5}$), the PM_{10} modeling results for the combustion sources only represent a reasonable screening analysis for $PM_{2.5}$ impacts. Those results are attached and demonstrate that presumed additional $PM_{2.5}$ concentrations when added to background levels would be well below both the annual and 24-hr standards for $PM_{2.5}$. For example, the maximum modeled concentration on an annual basis for PM_{10} was less than all but the lowest proposed significant impact limits for $PM_{2.5}$ (see 72 FR 54115). Accordingly, $PM_{2.5}$ emissions can be considered insignificant on an annual basis.

With respect to the 24-hr standard, modeled concentrations of PM_{10} for the proposed combustion sources were extracted from the PM_{10} NAAQS modeling. The 98th percentile value was compared against the standard less the most recent monitored background at the closest suburban monitor. The results are below the 24-hr $PM_{2.5}$ NAAQS.

	PM2.5 (ug/m3)															
	24-Hour Values							Annual		Monitor						
Row #	# Obs	1st Max	2nd Max	3rd Max	4th Max	98th Pct	# Exceed	Mean	# Exceed	Number	Site ID	Site Address	City	County	State	EPA Region
30	36	26	23.5	22.5	21.6	26	0	12.79	0	1	1.32E+08	2216 Bungalow Rd, Augusta Ga	Augusta	Richmond Co	GA	4

Avg. Period	98th Percentile Model Conc. (µg/m³)	98th Percentile Monitored Background Conc. (µg/m³)	Total Conc. ((µg/m³)	NAAQS (µg/m³)	Complies? (Y/N)
24-hr	3.5	26	29.5	35	Y